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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/783,265	02/19/2004	Young Nam Kim	006343.P002	7317

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Stephen M. De Klerk
BLAKELY, SOKOLOFF, TAYLOR & ZAFMAN LLP
Seventh Floor
12400 Wilshire Boulevard
Los Angeles, CA 90025

EXAMINER	
ONEILL, KARIE AMBER	
ART UNIT	**PAPER NUMBER**
1745	

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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/783,265	KIM, YOUNG NAM	
	Examiner	Art Unit	
	Karie O'Neill	1745	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *22 May 2007*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *8,9,12-16 and 20* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *8-9, 12-16 and 20* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *5-22-07*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on May 22, 2007, has been entered. Therefore, Claims 8-9, 12-16 and 20 are pending in this office action.

Claim Rejections - 35 USC § 103

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

3. Claims 8-9, 12, 14-16 and 20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Dasgupta et al. (US 2003/0152835 A1) in view of Gurin (US 2003/0151030 A1).

With regard to Claim 8, Dasgupta et al. disclose a process for preparing a carbon nanotube electrode, comprising the steps of: (1) preparing an electrode material by mixing spherical graphite, which contain about 1.5% to 15% carbon nanotubes, with a binder (paragraph 0023); (2) preparing a pressed electrode material by first pressing the graphite (carbon nanotube)/binder mixture into a pressed compact with copper foil on

one side (paragraph 0023); and (3) subsequently heat-treating, the heat-treating temperature range being from 40°C to 140°C (paragraph 0015), the previously pressed electrode material that is placed on a current collector so that the carbon nanotubes are bonded to each other and simultaneously bonded to the current collector (paragraphs 0016 and 0023).

Dasgupta et al. do not specifically disclose the pressed electrode material as being pressed under a pressure from 1 to 500 atm in step (2). However, it is well recognized in the art that the resulting density of the pressed powder is a function of compaction pressure, as evidenced in Figure 3 of Vu et al. (US 4,743,185) and Figure 4 of Kear et al. (US 6395214 B1). Therefore, it would have been within the skill of the ordinary artisan to fabricate the graphite/binder mixture at a pressure between 1 and 500 atm in Dasgupta et al., because Vu et al. and Kear et al. teach, respectively, the desirable green density of the mixture being achieved by modifying the applied pressure. *Discovery of optimum value of result effective variable in known process is ordinarily within skill of art.* In re Boesch, CCPA 1980, 617 F.2d 272, 205 USPQ 215.

Dasgupta et al. also do not disclose in step (1) wherein the binder comprises sulfur or metal nanoparticles having an average particle size of 1μm or less.

Gurin discloses carbon particles, including carbon nanotubes of both the single-walled and multi-walled type (paragraph 0056), combined with a metal coating of metal powder having an average particle size of from about 1 nanometer to 100 microns (paragraph 0034) deposited on the surface of said carbon particles. The metal particles are preferably selected from the group of at last one metal from Au, Ag, Pd, Pt, Cu, Ni,

Fe, Co, Be, Mo, Si, Tn, Sn, Al and In (paragraph 0059). As referenced on the website ChemicalElements.com, Indium (In) has a melting point of 156.6°C and Tin (Sn) has a melting point of 231.9°C, which falls within the heat-treating temperature range of the melting point of a binder comprising metal nanoparticles at ±200°C. Therefore, at the time of the invention it would have been obvious to one of ordinary skill in the art to use a carbon nanotube mixed with metal nanoparticles for preparing the electrode of Dasgupta et al., because Gurin teaches the conductivity of the carbon nanotubes being enhanced with a metal nanoparticle coating, the smaller the particle size for said metal powders the better the conductivity enhancement (paragraph 0058).

With regard to Claim 9, Dasgupta et al. disclose wherein the graphite (carbon nanotube)/binder is compressed into a pressed compact with copper foil acting as a curret collector. Dasgupta et al. do not disclose that the electrode material is uniformly dispersed on the current collector and then pressed. However, it is the position of the examiner that such properties are inherent, given that both Dasgupta et al. and the instant application utilize the same materials and perform the same step of pressing. A reference which is silent about a claimed invention's features is inherently anticipatory if the missing feature is necessarily present in that which is described in the reference. *In re Robertson*, 49 USPQ 2d 1949 (1999).

With regard to Claim 12, Gurin discloses, wherein in step (1), the mixing of the carbon nanotubes with the metal nanoparticles is performed by a method of solvent mixing (paragraphs 0127 and 0134-0136). Therefore, at the time of the invention it would have been obvious to one of ordinary skill in the art to solvent mix the carbon

nanotubes and metal nanoparticles of Dasgupta et al., because Gurin teaches imparting metal nanoparticles onto the surface of the carbon nanotubes to improve dispersion and reduce interfacial tension as a means to improve conductivity (paragraph 0065).

With regard to Claim 14, Dasgupta et al. disclose the process wherein the pressing in step (2) provides the electrode material in the shape of a disk or film. Dasgupta et al. call this a pressed compact (paragraph 0023).

With regard to Claim 15, Dasgupta et al. disclose the process wherein in step (3), the pressing and heating are carried out consecutively by first forming the pressed compact (paragraph 0012) and then heat treating the electrode after preparation (paragraph 0016).

With regard to Claim 16, Dasgupta et al. disclose the process wherein in step (3) the heat treatment is carried out by through thermal heating in a temperature range from 45°C to 80°C (paragraph 0016).

With regard to Claim 20, Dasgupta et al. disclose the carbon nanotube or carbon nanofiber electrode prepared for use in a lithium secondary battery (paragraph 0023).

4. Claim 13 is rejected under 35 U.S.C. 103(a) as being unpatentable over Dasgupta et al. (US 2003/0152835 A1) and Gurin (US 2003/0152835 A1), as applied to Claims 8-9, 12, 14-16 and 20 above, and in further view of Choi et al. (US 2004/0018416 A1).

Dasgupta et al. and Gurin disclose the process for preparing a carbon nanotube elelctrode in paragraph 3 above, but do not disclose wherein the method of uniformly dispersing the metal nanoparticles on the surface of the carbon nanotubes is carried out

by a method selected from the group consisting of catalytic impregnation followed by an optional oxidation or reduction, precipitation, chemical vapor deposition (CVD), electrodeposition, plasma spraying, and sputtering.

Choi et al. disclose wherein in step (1), the mixing of carbon nanotubes with metal nanoparticles is preformed by a method chosen from the group consisting of uniformly dispersing the metal nanoparticles on the surfaces of the carbon nanotubes (paragraph 0031) and wherein the method of uniformly dispersing the metal nanoparticles on the surfaces of the carbon nanotubes is carried out by a method selected from the group consisting of electrophoresis, thermal spraying, sputtering, chemical vapor deposition and any other techniques common to one of ordinary skill in the art (paragraph 0033). Therefore, at the time of the invention it would have been obvious to one of ordinary skill in the art to uniformly disperse the metal nanoparticles on to the carbon nanotubes of Dasgupta et al. and Gurin, because Choi et al. teach evenly distributing metal nanoparticles on to the carbon nanotubes so that they are fixed stably thereto so as not to be affected by an external force (paragraph 0029).

Response to Arguments

5. *Applicant's principal arguments are:*

(a) Dasgupta et al. disclose ion conducting polymeric binder is used as a binder, and the preset invention uses sulfur or metal nanopartilces as the binder binding the carbon nanotubes.

(b) Dasgupta et al. disclose the step of heat-treating taking place at a temperature of 40°C to 140°C, which differs from the heat-treating temperature of the present invention.

In response to Applicant's arguments, please consider the following comments:

(a) There are several types of binder and methods of binding. However, it is not disclosed in the claims that the sulfur or metal nanoparticles are the only binder present in the invention. Independent claim 8 reads, "with a binder **comprising** sulfur or metal nanoparticles", which does not limit the claim to having only sulfur or metal nanoparticles as the binder.

(b) Dasgupta et al. does not disclose a binder comprising metal particles, but does disclose a heat-treating temperature range of 40°C to 140°C. However, Gurin disclose a list of metal particles that are used to coat the carbon nanoparticles of the electrode material. In that list, the element Indium (In) has a melting point of 156.6°C and Tin (Sn) has a melting point of 231.9°C. The heat-treating range of Dasgupta et al. is within the range, ±200°C, of the melting point of Indium (In) and Tin (Sn), listed as possibilities to be used as the metal particles of the invention.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Karie O'Neill whose telephone number is (571) 272-

8614. The examiner can normally be reached on Monday through Friday from 8am to 5pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Patrick Ryan can be reached on (571) 272-1292. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Karie O'Neill
Examiner
Art Unit 1745

KAO

DAH-WEI YUAN
PRIMARY EXAMINER